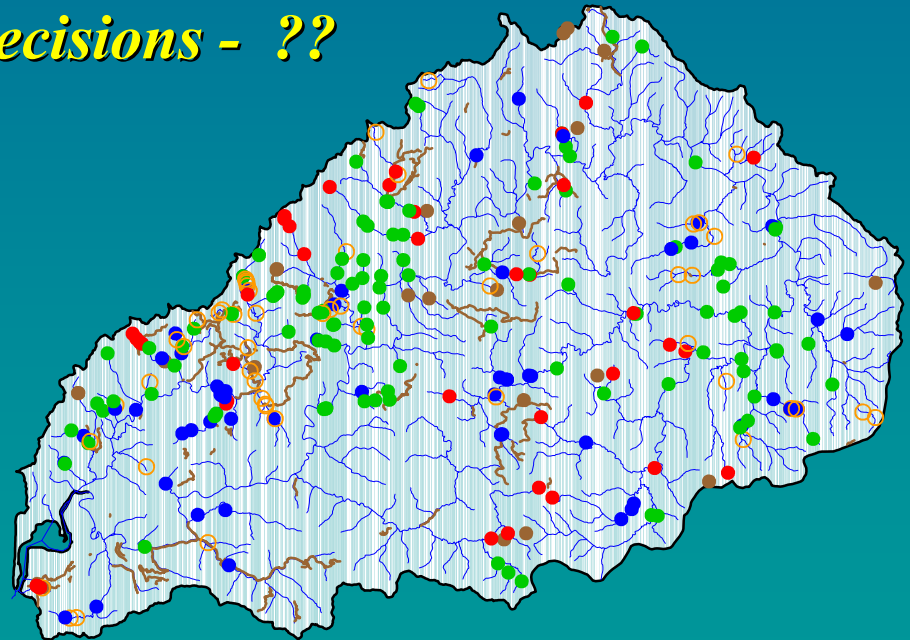


Is Monitoring the Answering the Right Questions?

Asking the Right Questions - Easy
Establishing Monitoring Programs – Harder
Maintaining Support – Hardest
Application to Policy Decisions - ??



Kelly Moore
Oregon Watershed Enhancement Board
[//www.oweb.state.or.us/](http://www.oweb.state.or.us/)

Oregon Plan Monitoring – Strategic Framework

Outcomes	Questions	Strategies	Indicators & Information
<p>Outcome One: Assessment of watershed conditions and salmon populations</p> <p>Identify the appropriate indicators of population and watershed condition, the appropriate scales of inquiry, and the appropriate level of precision needed.</p>	<p>What is the condition of aquatic habitat and watershed systems?</p> <ol style="list-style-type: none"> 1. What is the condition of salmon populations at the ESU, Sub-Basin and watershed scale? 2. What is the status and what are the trends in aquatic habitats, water quality, and stream flow,? 3. What are the critical factors that limit watershed function and salmon productivity? 4. What constitutes detectable and meaningful changes in populations and habitat condition? 	<ol style="list-style-type: none"> 1. Assess general status and trends for physical habitat, salmon populations, and biotic conditions in Oregon <u>Sub-Basins and ESU Regions</u>. 2. Monitor habitat capacity, salmon survival and productivity, and biotic processes in <u>select Watersheds within each sub-basin or ESU region</u>. 3. Analyze habitat trends and salmon populations in the context of local or regional effects, landscape influences, and ocean productivity. 	<p>Landscape Characterization: Land cover – Upland Habitats</p> <p>Riparian Condition: canopy composition, site potential</p> <p>Habitat Condition: channel morphology, fish passage.</p> <p>Salmon: abundance, geographic distribution, life history, diversity, and productivity</p> <p>Biotic Condition: invertebrate communities, toxics.</p> <p>Water quality:: temperature, DO, pH, sediment, bacteria</p> <p>Stream flow: duration, peak flow events, minimum flows</p>

Oregon Plan Monitoring – Strategic Framework

Outcomes	Questions	Strategies	Indicators & Information
<p>Outcome Two: Evaluation of Oregon Plan restoration actions and conservation measures</p> <p>Evaluate the relative importance of restoration activities as a contribution to watershed health. Develop analytical models to evaluate changes produced by the Oregon Plan to target conditions and recovery goals.</p>	<p>What is the benefit of restoration projects, management practices, and conservation programs?</p> <p>5. What changes are occurring in watersheds?</p> <p>6. What are the management practices and programs that enhance or restore watershed functions and salmon populations?</p> <p>7. What habitat changes and biotic responses result from these projects, practices, and programs?</p>	<p>4. Document implementation of restoration projects, conservation activities, and agency programs.</p> <p>5. Evaluate the local effectiveness of restoration efforts - monitor a representative sample of specific project, activity, and program types.</p> <p>6. Evaluate the combined effectiveness of restoration efforts by monitoring habitat and population response in a structured sample of watersheds.</p>	<p>Broad Scale Impacts: --ocean productivity --precipitation --disturbance events drought, fire, etc.</p> <p>I Instream, riparian, road, projects type, number and location. Habitat and biotic indicators of project effectiveness.</p> <p>Compliance rates and effectiveness measures of policy guidelines and rules</p> <p>Component and cumulative analysis of restoration actions and management program benefits</p>

Coastal Oregon Basins

Watershed Assessments

Water Quality, Stream, and Riparian Habitat Sampling

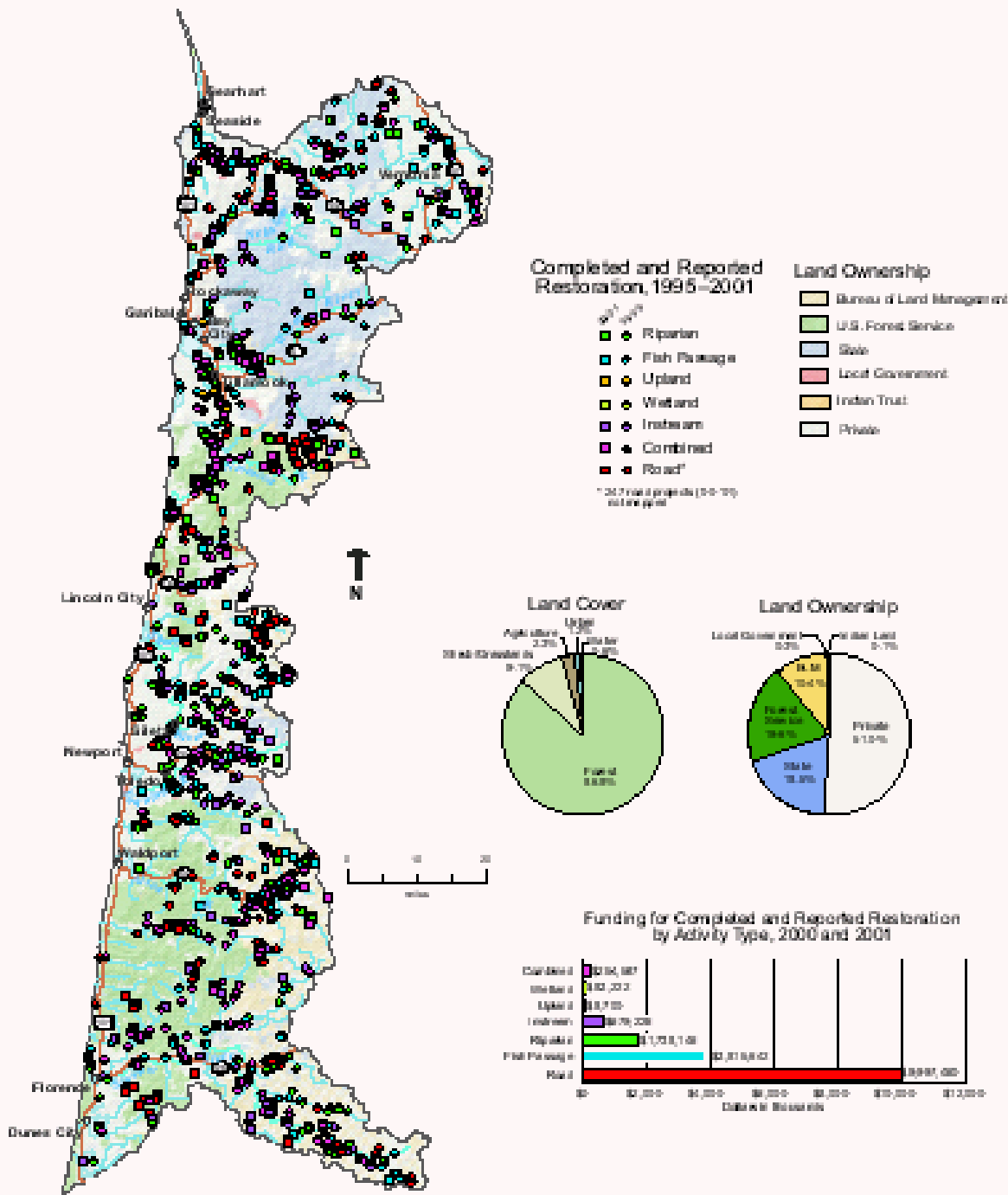
Adult Abundance and Distribution

Juvenile Abundance and Distribution

Freshwater and Marine Survival

Project and Program Documentation

Project and Program Evaluation



Central and Eastern Oregon Basins

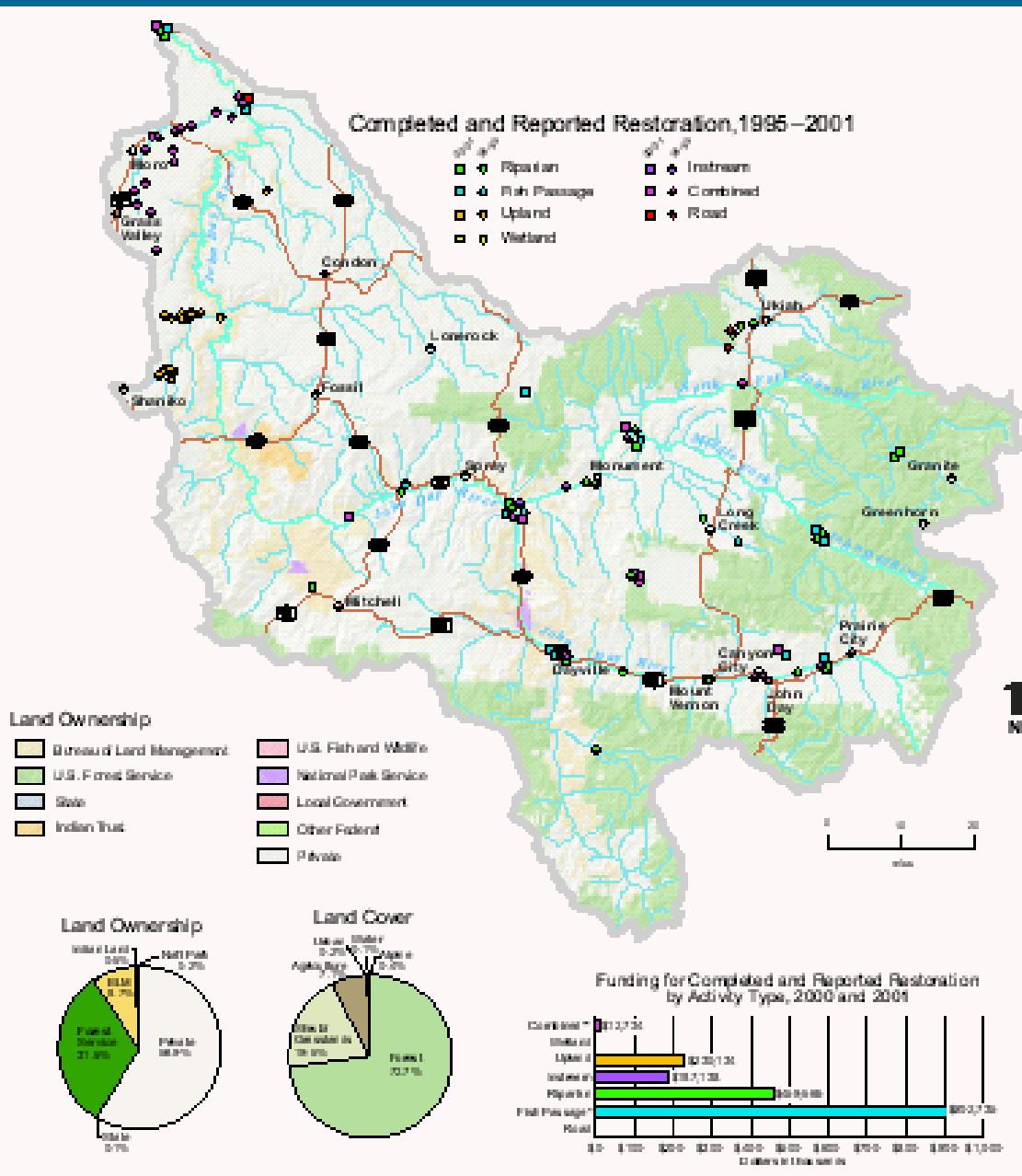
Watershed Assessments

Stream and Riparian Habitat Surveys

Salmon Abundance Indices

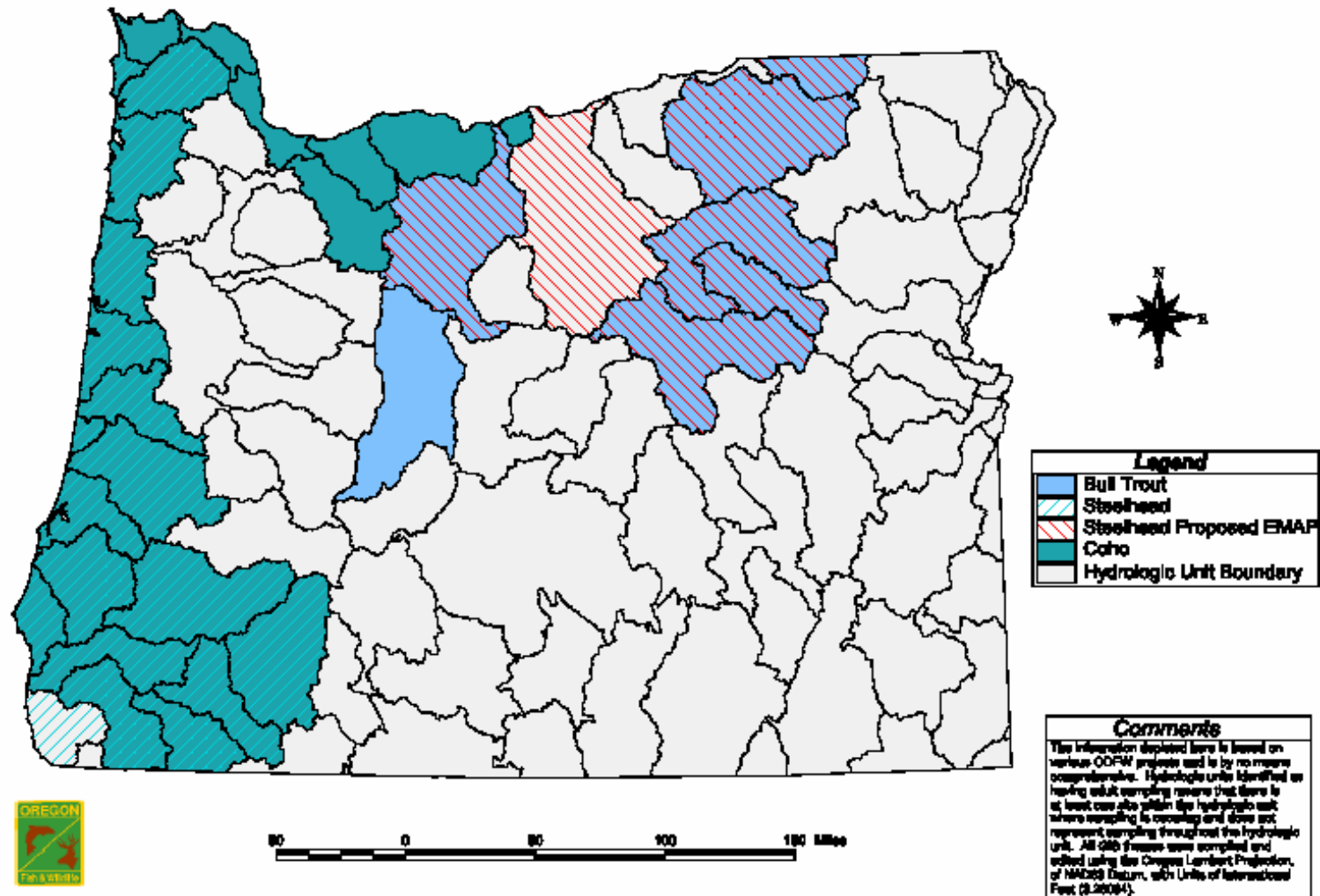
Project and Program Documentation

Project and Program Evaluation



What difference does it make?

Adult Surveys - EMAP



Oregon Plan Monitoring Strategy

- Supports ESA Recovery Planning
- Provides quantitative answers to critical questions – habitat, fish, water quality
- Guides investment in restoration
- Can support NWPPC Sub-Basin Planning and Columbia Bi-Op Monitoring (R,M,E)

Does **not** do everything that is needed



Oregon Plan Monitoring Strategy

- Endorsed by Oregon's IMST Science Team
- Adopted by the OWEB Board and Oregon's Natural Resources Cabinet
- Sampling approach supported by EPA and recommended by NWPPC ISRP



Oregon Center for Strategic Planning
and Program Development

Juvenile Monitoring: Key Questions

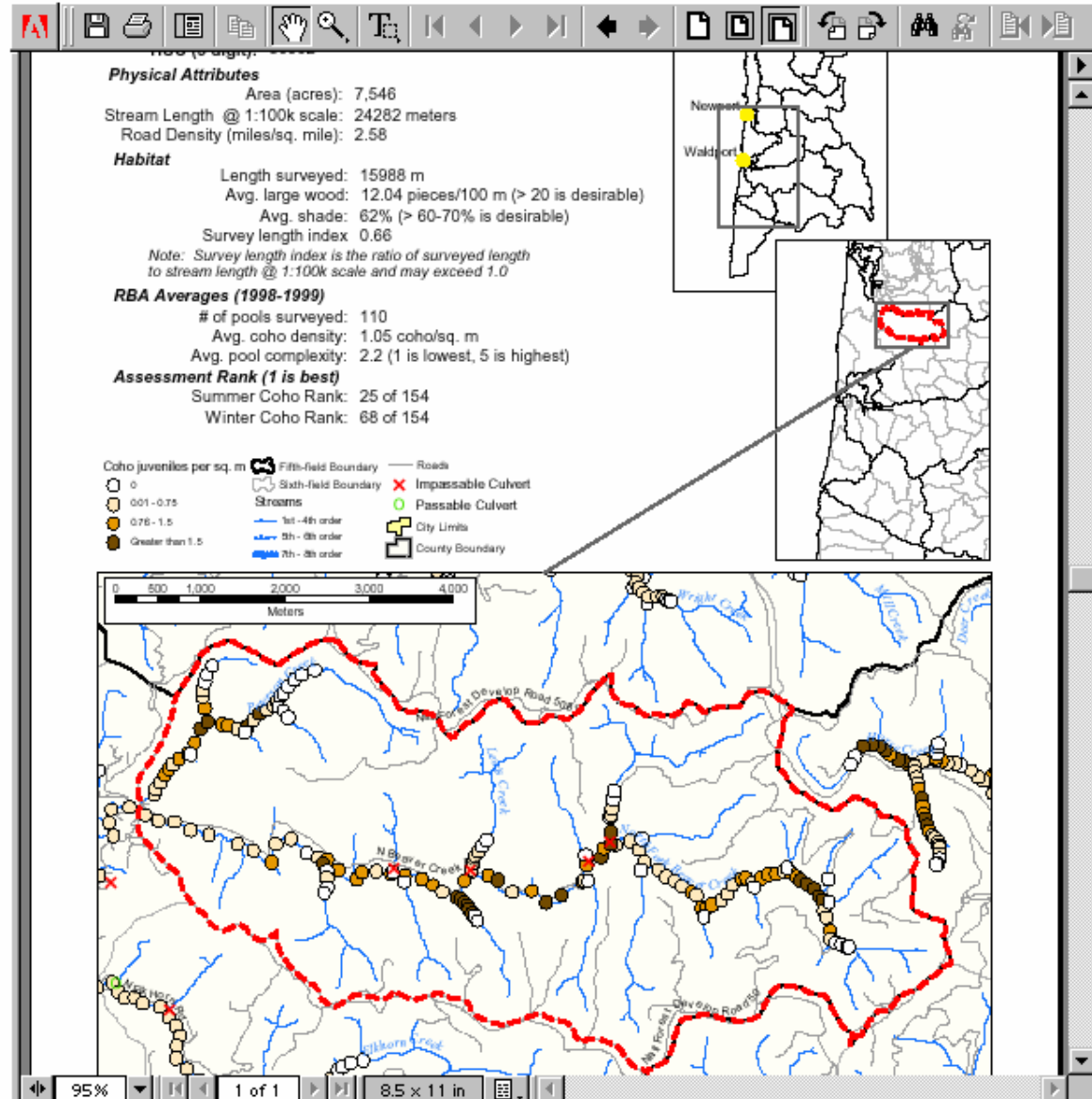
- **Are juvenile coho abundance and survival increasing within each Monitoring Area?**
- **Are there consistent geographic patterns in relative juvenile coho abundance or survival that can be attributed to environmental variations, habitat conditions, or levels of adult escapement?**
- **Is the distribution of juvenile coho expanding or contracting within each Monitoring Area?**

Please click on the map over the area you're interested in. After the map is zoomed in, click on a subbasin to view the watershed report for that 6th field watershed.

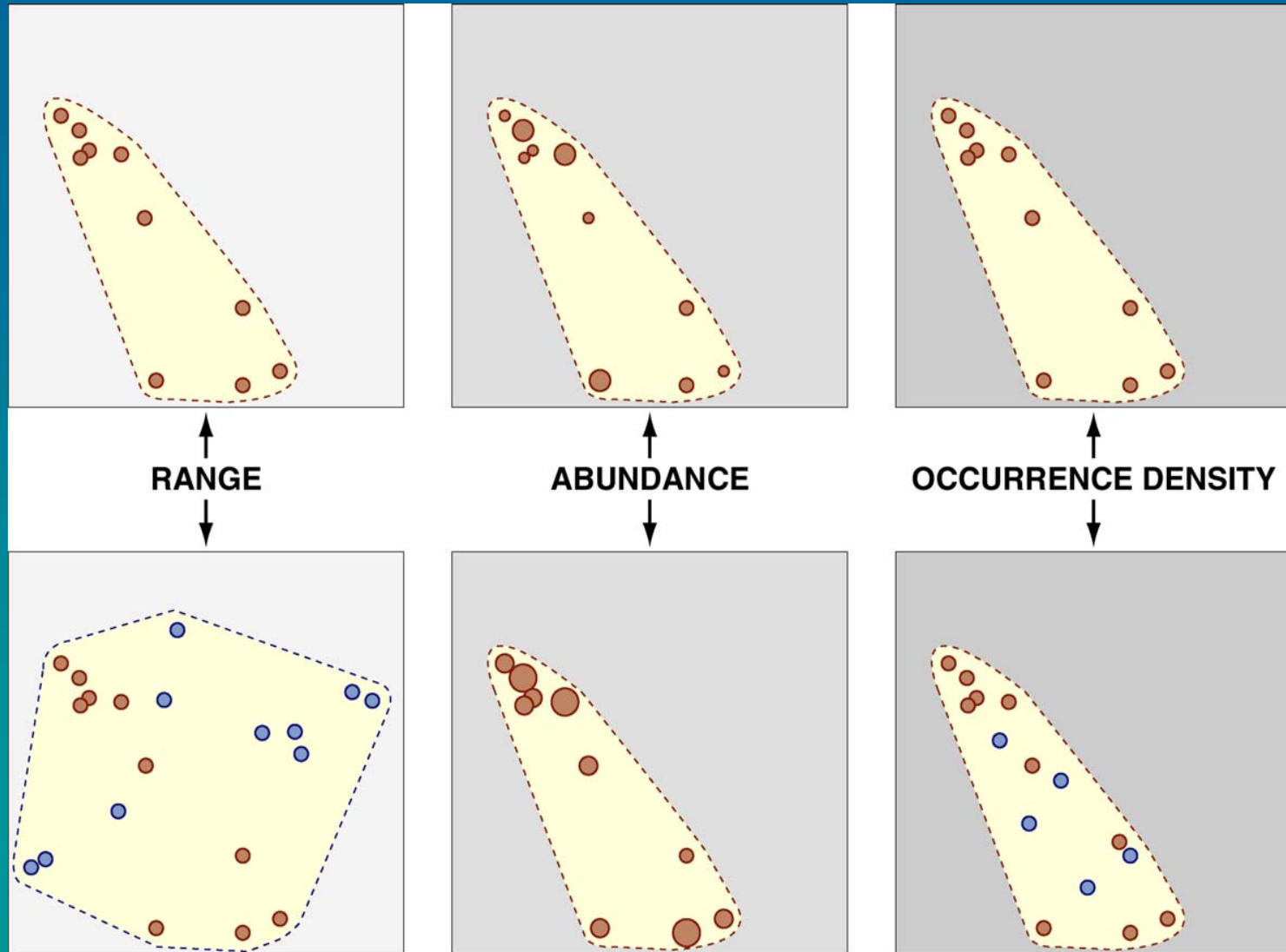
To zoom out to the full map, click on the 1:1 button to the left of the map.

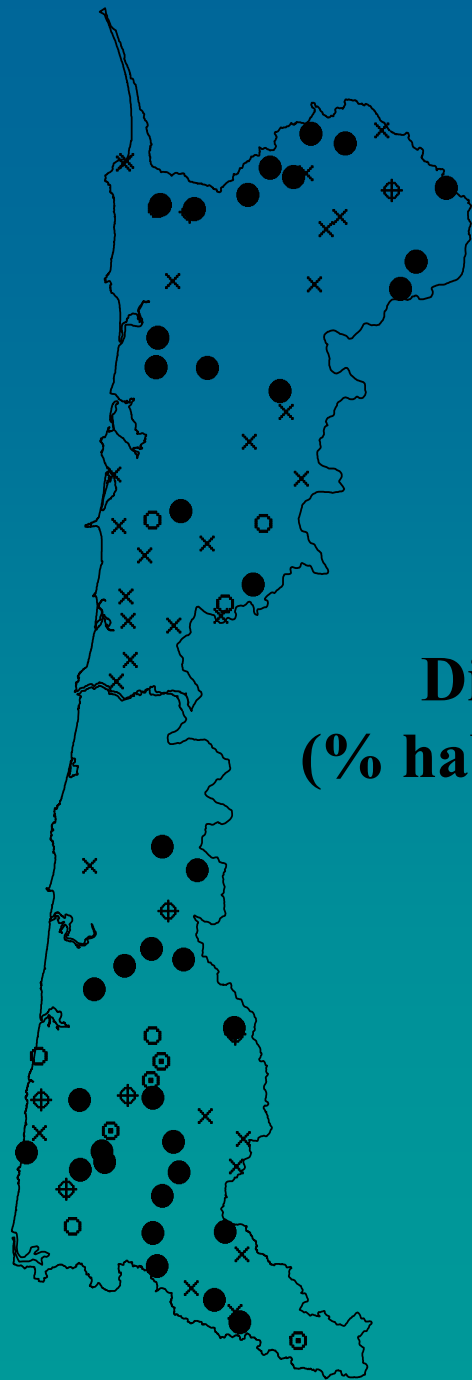
For more information about 303(d) listed streams, visit Oregon's [DEQ Online 1998 303\(d\) list](#). Select the Mid Coast basin, then the appropriate subbasin to see more details on listed streams.

[Basin Browser Documentation and Metadata](#)



Sample surveys answer questions about spatial pattern





Distribution
(% habitat occupied)

Symbol Key	
x	0%
○	0.1 - 25%
⊙	25.1 - 50%
⊕	50.1 - 75%
●	75.1 - 100%



Abundance
(fry/m² pool)

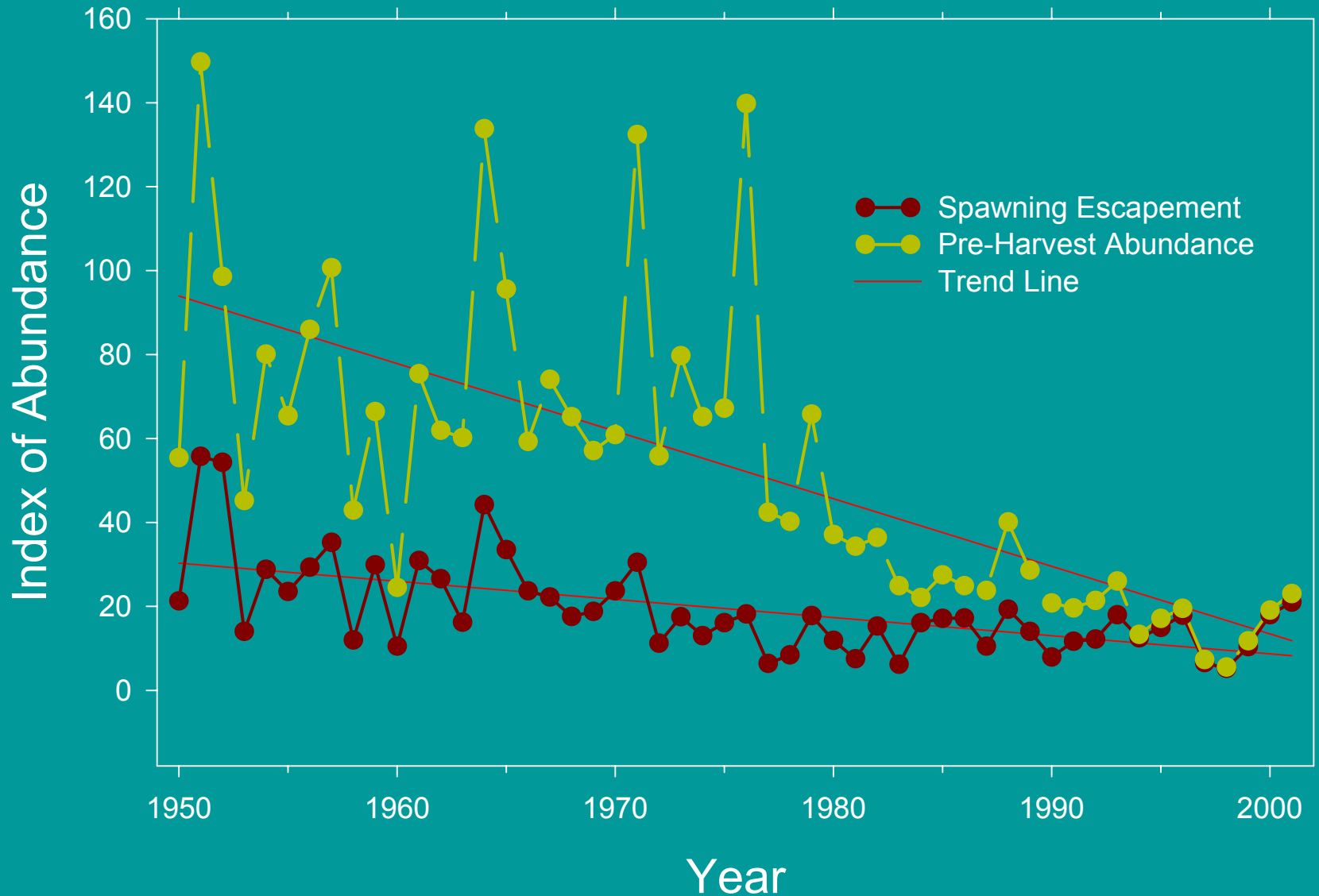
Symbol Key	
x	0
○	> 0 - 0.23
⊙	> 0.23 - 0.46
⊕	> 0.46 - 0.69
●	> 0.69

Adult Monitoring: Key Questions

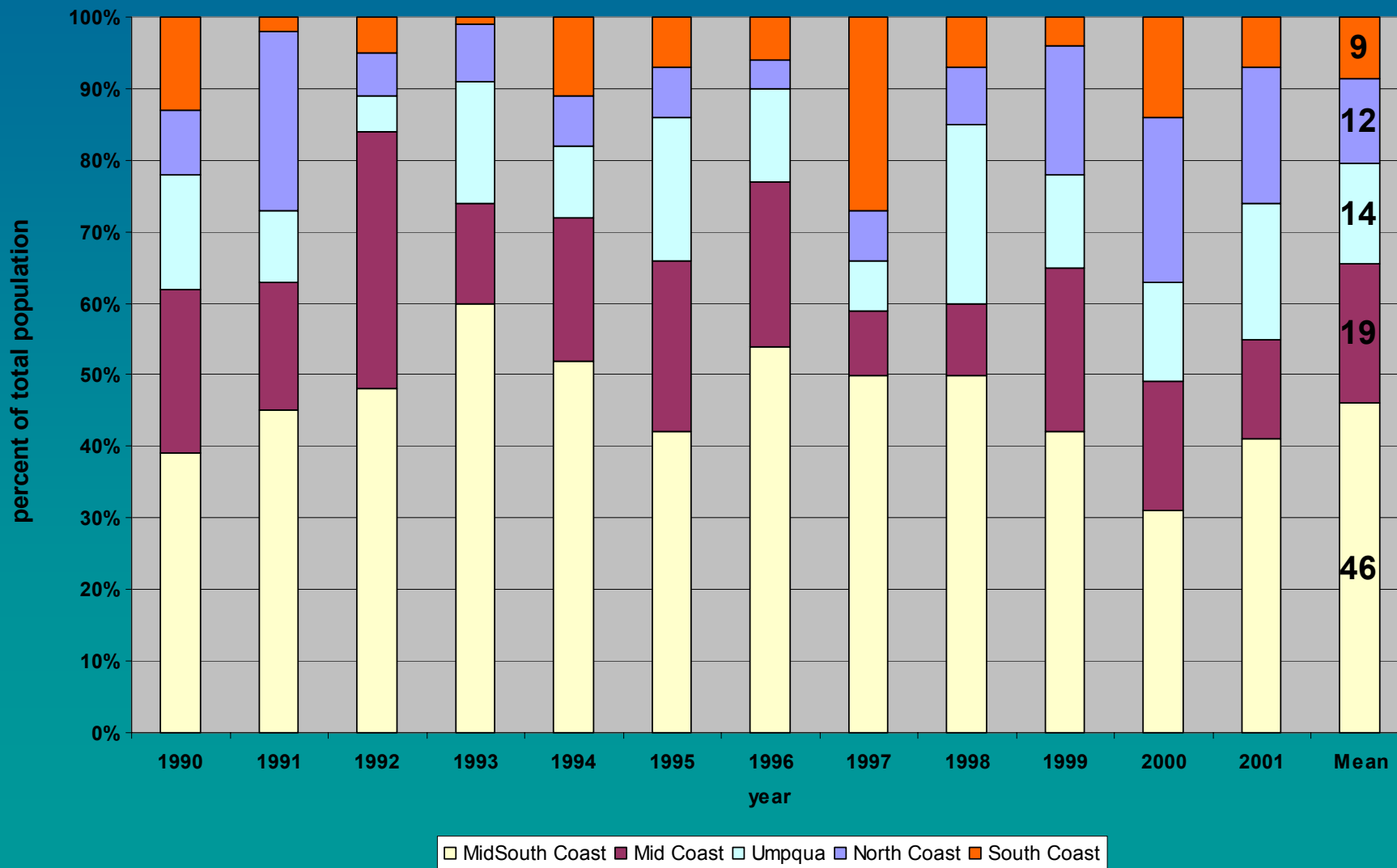
- How many adults are there?
- How does abundance change over time?
- Are there geographic patterns in adult abundance that can be attributed to environmental variations or habitat conditions?
- Is the distribution of adults coho expanding or contracting?

HISTORIC ABUNDANCE INDEX

Oregon Coast ESU, 1950-2001



Coho Abundance By Monitoring Area



Precision of Spawner Abundance Estimates

ODFW Coastal Oregon – Coho Adults

1998-2001

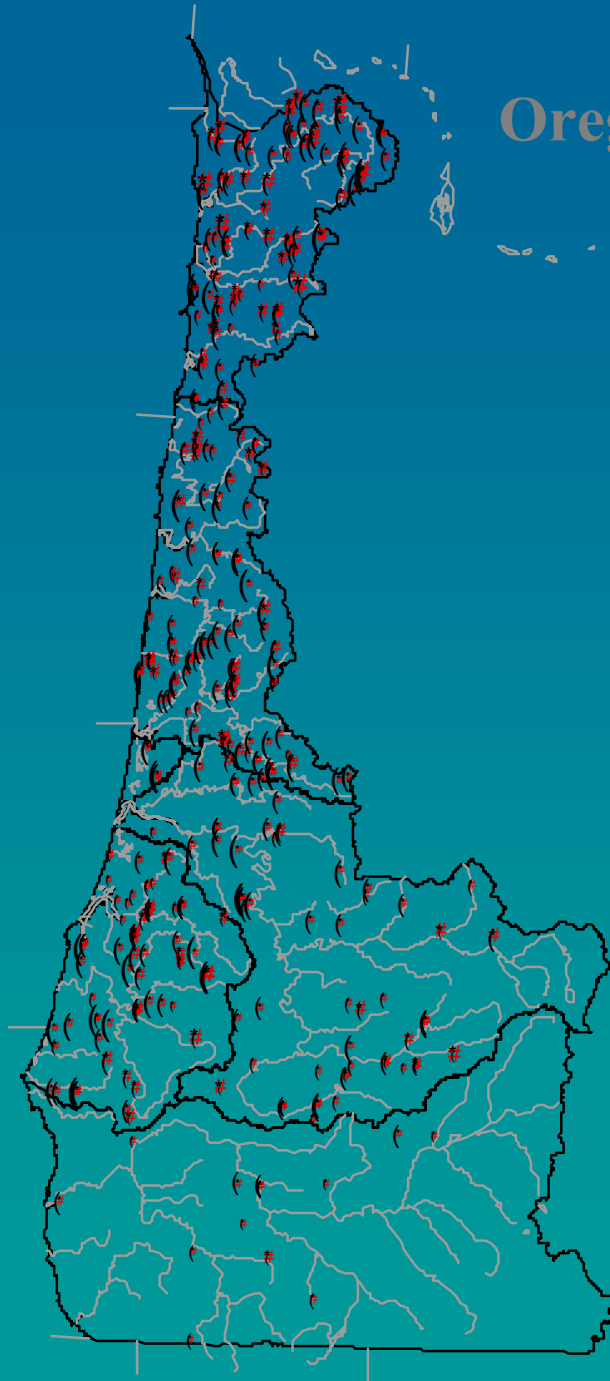
Geographic Unit	1990-97	Goal	Conventional	EMAP
COHO ESU	$\pm 28\%$	$\pm 20\%$	$\pm 21\%$	$\pm 16\%$
Monitoring Area	$\pm 54\%$	$\pm 30\%$	$\pm 37\%$	$\pm 22\%$
Watershed ^{4th Field}	$\pm 63\%$	$\pm 60\%$	$\pm 52\%$	$\pm 35\%$

Fish Habitat: Key Questions

- * What are the status and trends in habitat quality and quantity within each Monitoring Area?**
- * Are trends in freshwater habitat conditions reflected in trends in fish abundance and distribution?**
- * Are trends in habitat quality reflected in the geographic range and life-history diversity of salmonids?**

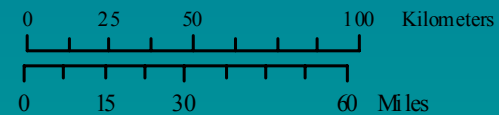
Oregon Plan Survey Sites 1998-2001

Coho Rearing Areas

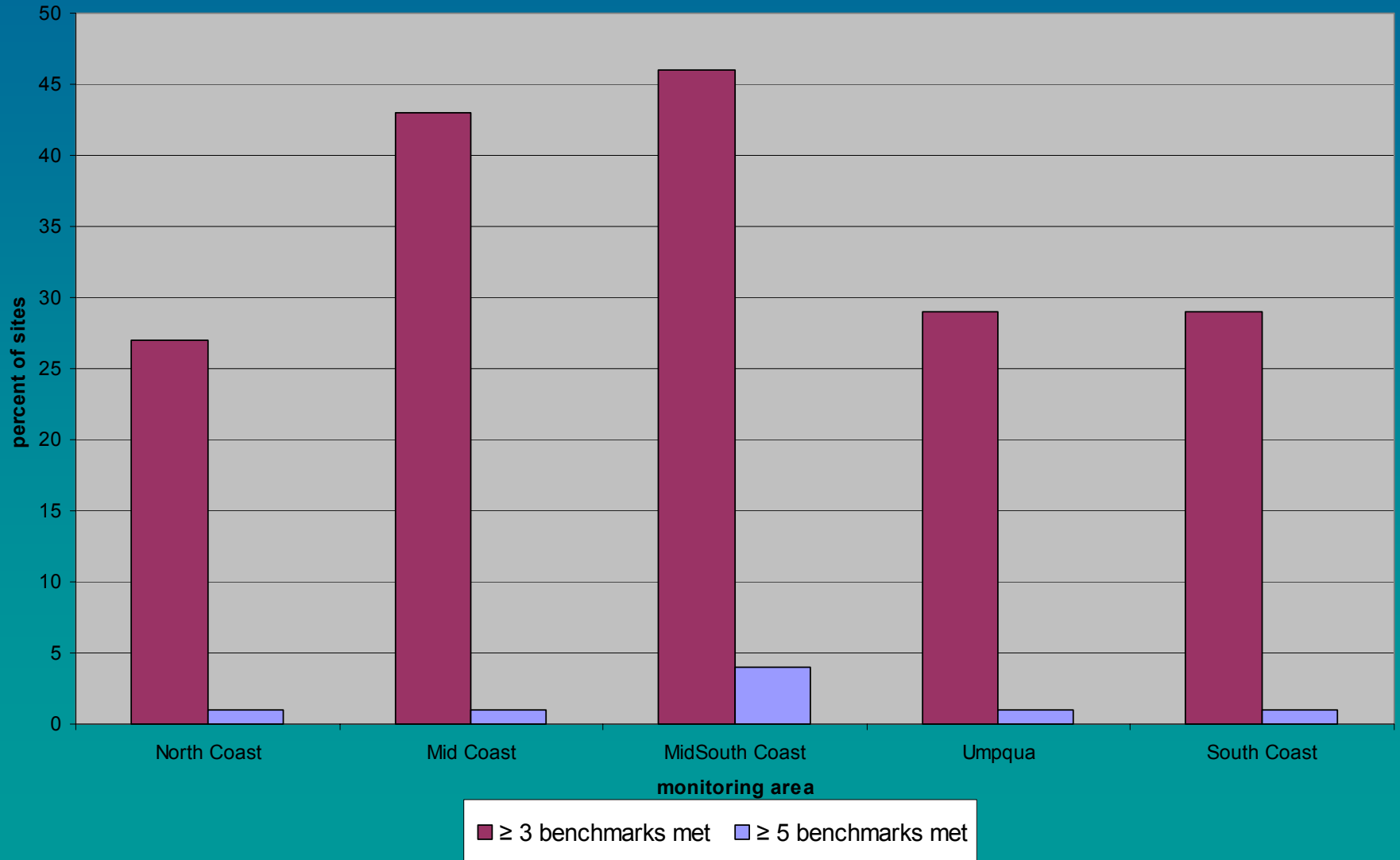


Legend

Percent pools	Volume wood debris per 100m
(<15%	0-20
(15-30%	20-30
(30-60%	30-70
(60-80%	70-115
(>80%	>115



Habitat Quality



When do we get an answer?

- How long for 50 site network (sampled 1x/yr) to detect 2% change in indicator per year?

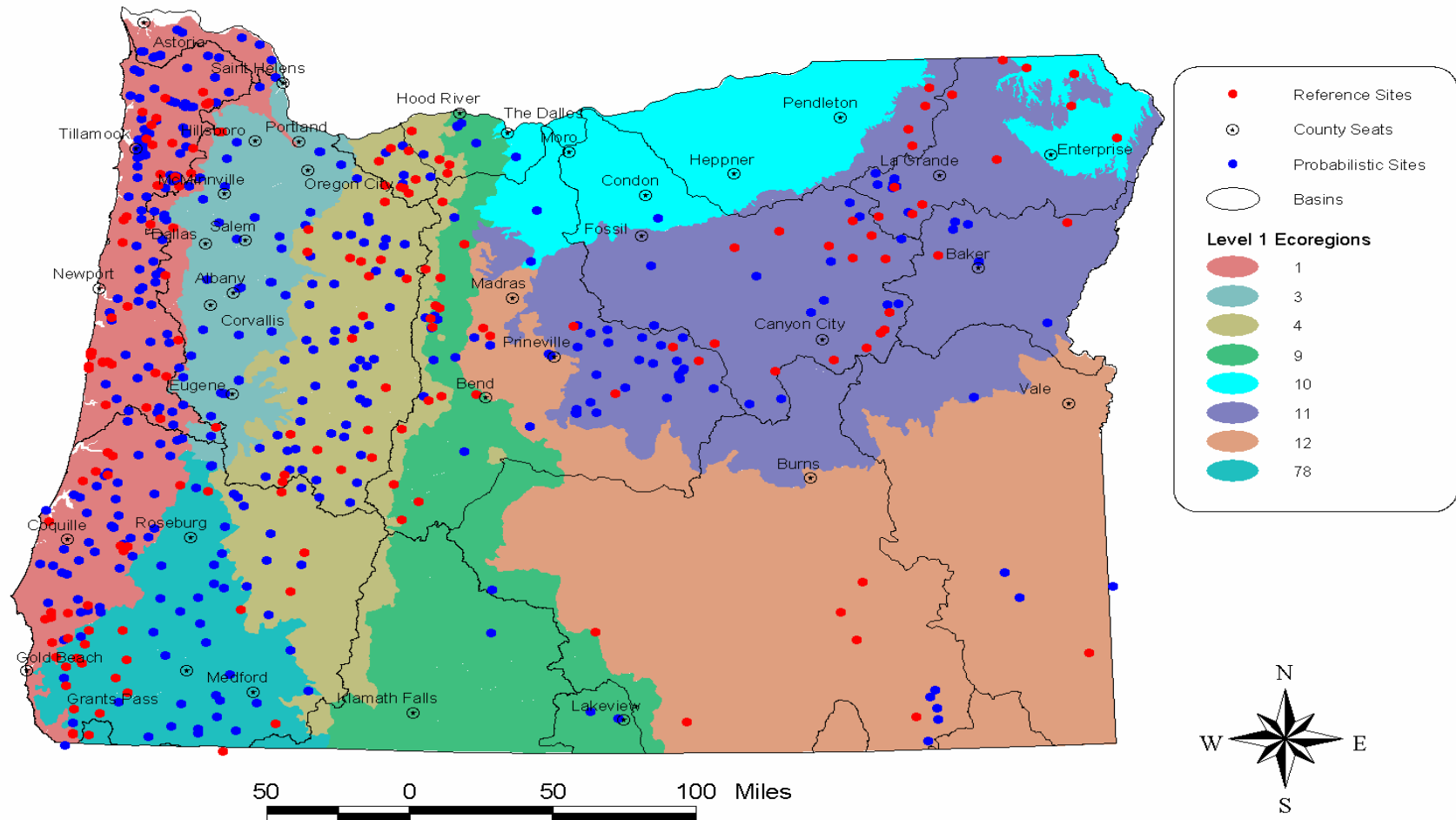
	<u>2%</u>	<u>1%</u>
- Std.Dev Thalweg Depth -----	8 yr	
- Mean Residual Depth -----	12	
- % Sand & Fines -----	12	
- % Embeddedness -----	12	
- Relative Bed Stability -----	8	
- Large Woody Debris Volume -----	16	
- 3-Layer Rip. Woody Veg. Cvr. -----	8	
- Canopy Density -----	8	

WATER QUALITY MONITORING DEQ/EMAP BIOMONITORING



Link to Statewide/Regional Programs

Oregon DEQ Biomonitoring Sites

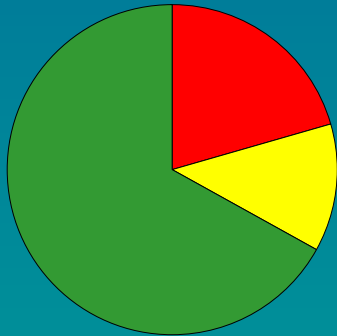


Indicator Development

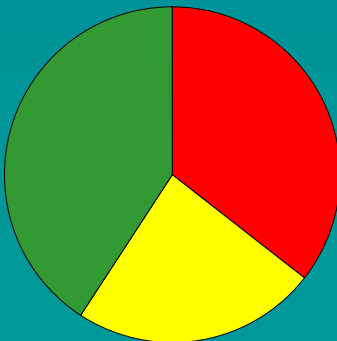
Indicator	Good	Fair	Poor	Standard/Cutpoint/Recommendation
Macroinvertebrate Community Score	>0.85	0.85 - 0.75	<0.75	Cutpoint based on 10th and 25th percentile of reference condition
Vertebrate Community Score	>60	60 - 50	<50	Cutpoint based on 10th and 25th percentile of reference condition
Percent Fine Sediment	<22%	22 - 35%	>35%	Cutpoint based on 10th and 25th percentile of reference condition
Percent Shade	>50%	50 - 32%	<32%	Cutpoint based on 10th and 25th percentile of reference condition
Water Temperature (seasonal max 7-day moving average of daily max)	<17.8 C	na	>17.8 C	Standard - OAR section 340
Oregon Water Quality Index	>89	89 - 80	<80	Cutpoint based on 10th and 25th percentile of reference condition

North Coast

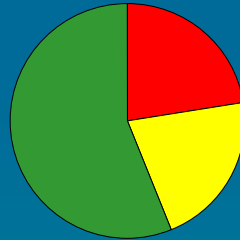
Macroinvertebrate Community



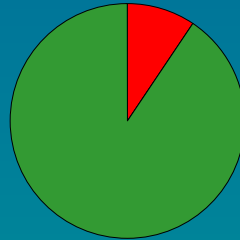
Vertebrate Community



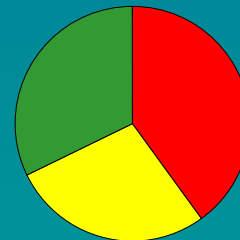
Water Quality



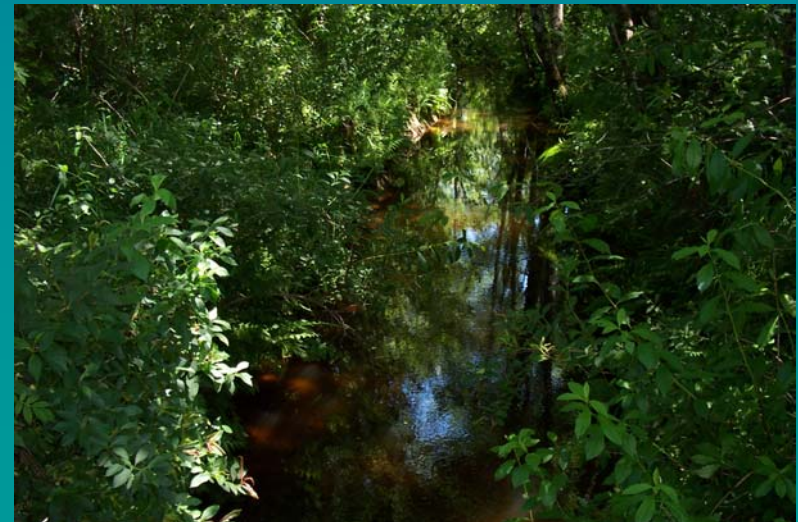
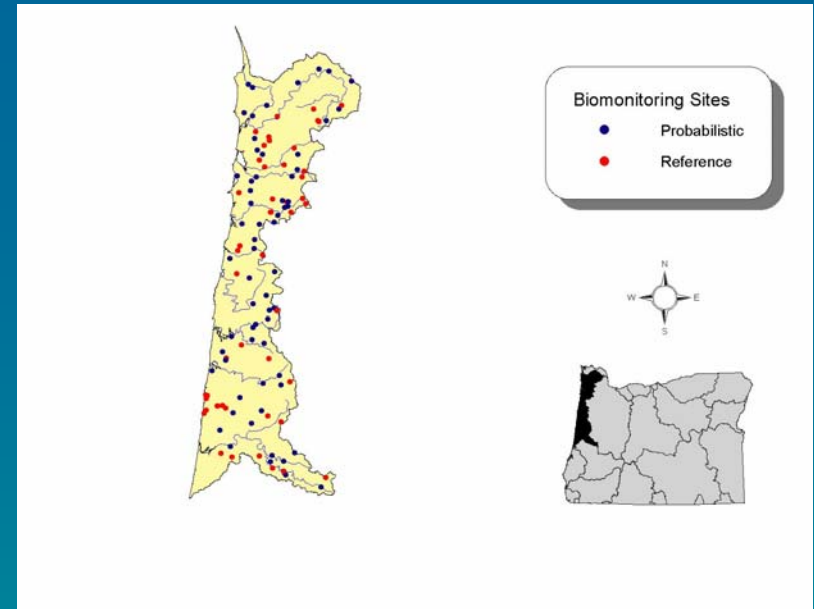
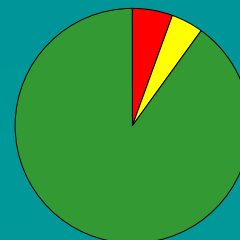
Temperature



Fine Sediment



Shade



Scorecard for Western Oregon Streams

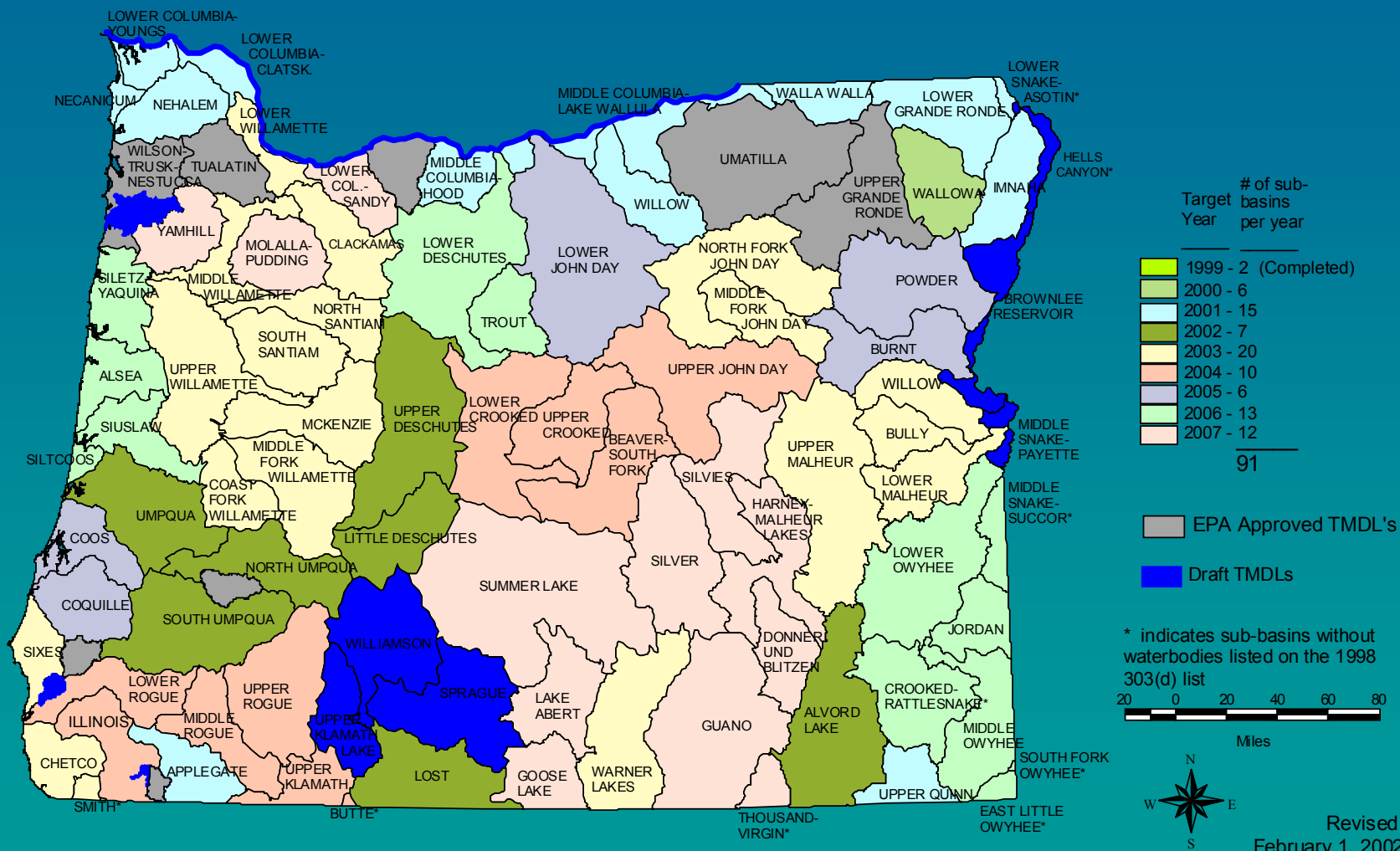
Condition and Stressor Ranking	Basins					Ecoregions			
	North Coast	Umpqua	Rogue	South Coast	Willamette	Coast Range	Klamath Mountains	Willamette Valley	Cascades
Ecological Conditions									
-Macroinvertebrates	Yellow	Red	Yellow	Yellow	Red	Yellow	Red	Red	Red
-Vertebrates	Red	Red	Yellow	Yellow	Red	Red	Red	Red	Green
Potential Stressors									
-Fine Sediment	Red	Red	Yellow	Red	Red	Red	Yellow	Red	Yellow
-Shade	Green	Green	Green	Green	Green	Green	Green	Green	Green
-Water Temperature	Green	Red	Yellow	Yellow	Red	Yellow	Red	Red	Green
-Water Quality	Yellow	Red	Yellow	Yellow	Yellow	Yellow	Red	Red	Green

Note:

Green = <10% of stream miles ranked as poor condition. Yellow = 10-25% of stream miles ranked as poor condition.

Red = >25% of stream miles ranked as poor condition.

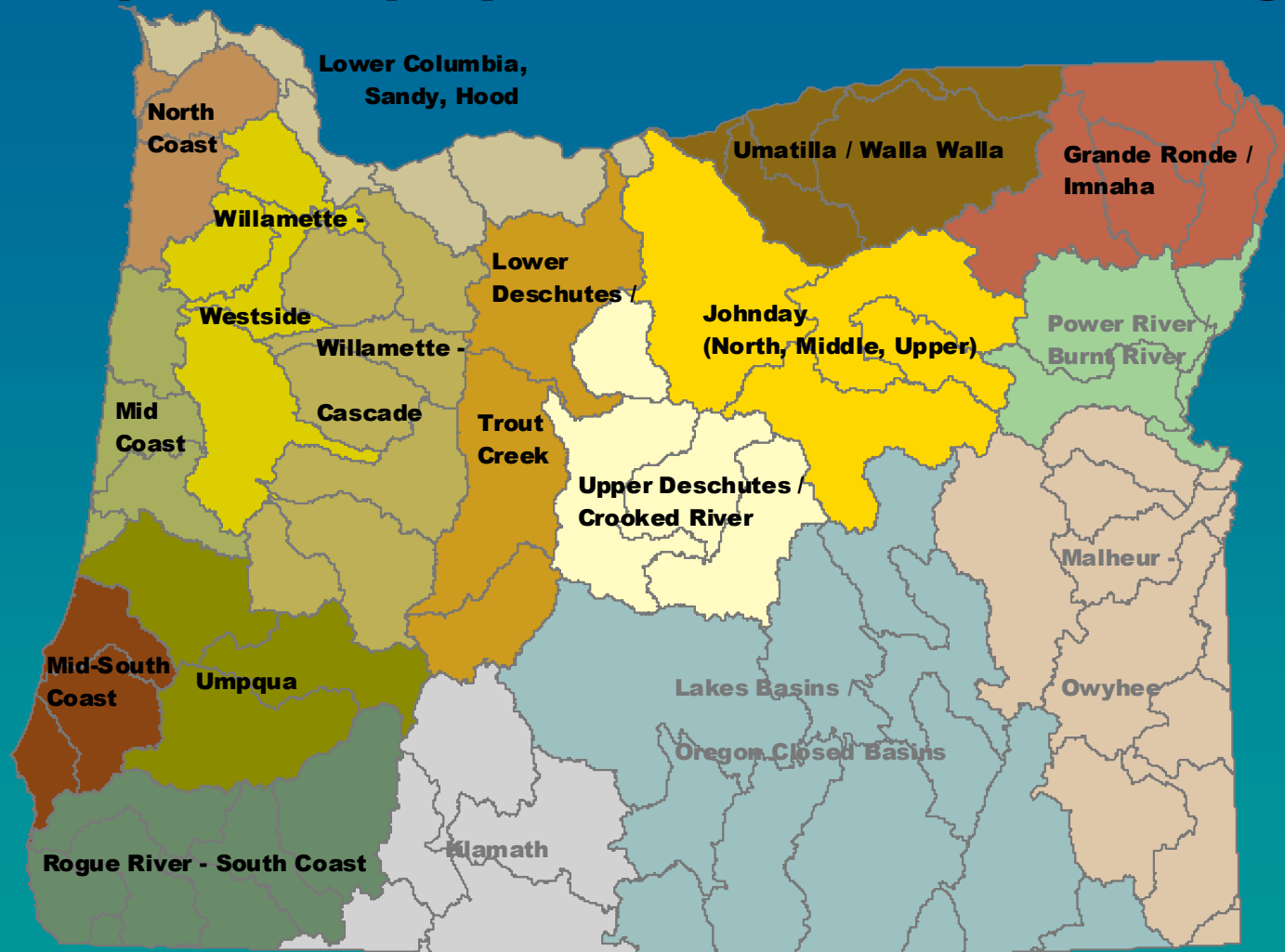
Sub-Basin Target Dates for Completion of TMDL's for Waters Listed in the 1998 303(d) List



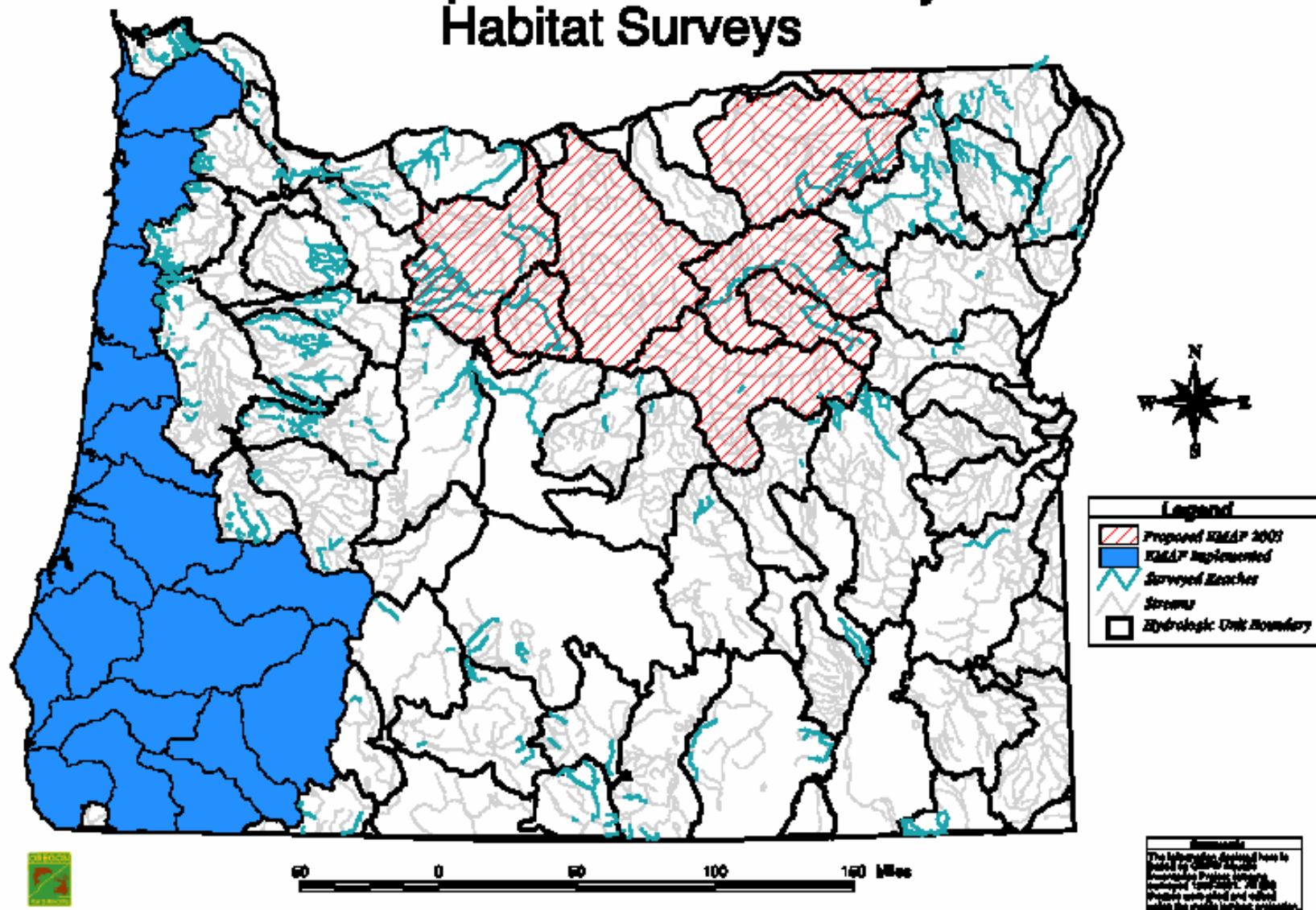
Implementation Issues

- Expand EMAP approach to all Oregon Basins
- Integrate Analysis in Subset of 4th Field Watersheds
- Validate Effectiveness in Research Watersheds
- Improved Coordination with Federal Land Mgmt. Agencies
- Identifying “who will do what?” across jurisdictional boundaries.

Spatial Deployment of EMAP Monitoring



ODFW Aquatic Inventories Project: Habitat Surveys





Watershed Assessments

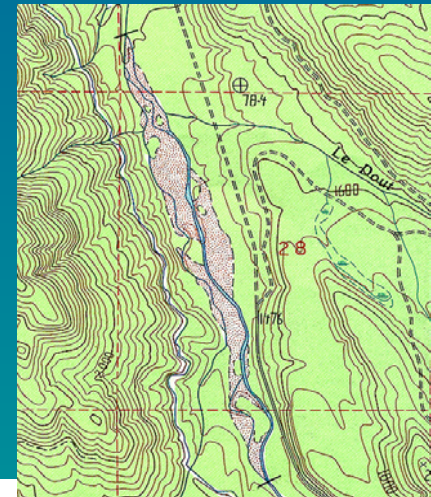
Mapping Channel Habitat Types: Confinement, gradient, stream size

**Evaluating
Your Watershed**
*Oregon Watershed
Assessment Manual*

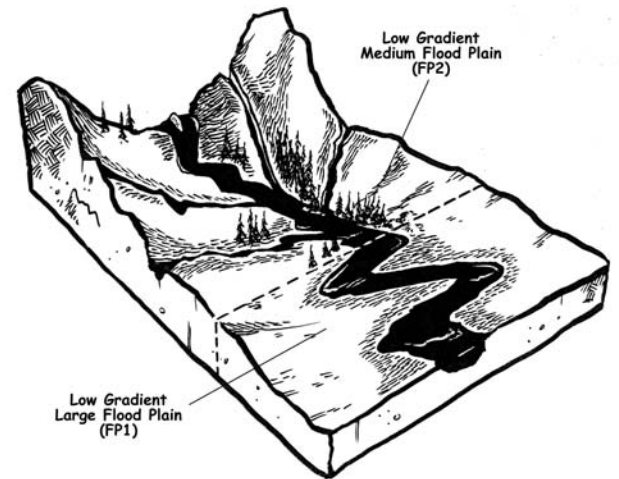
Channel Habitat Type Classification



Very Steep Headwaters
(VH)

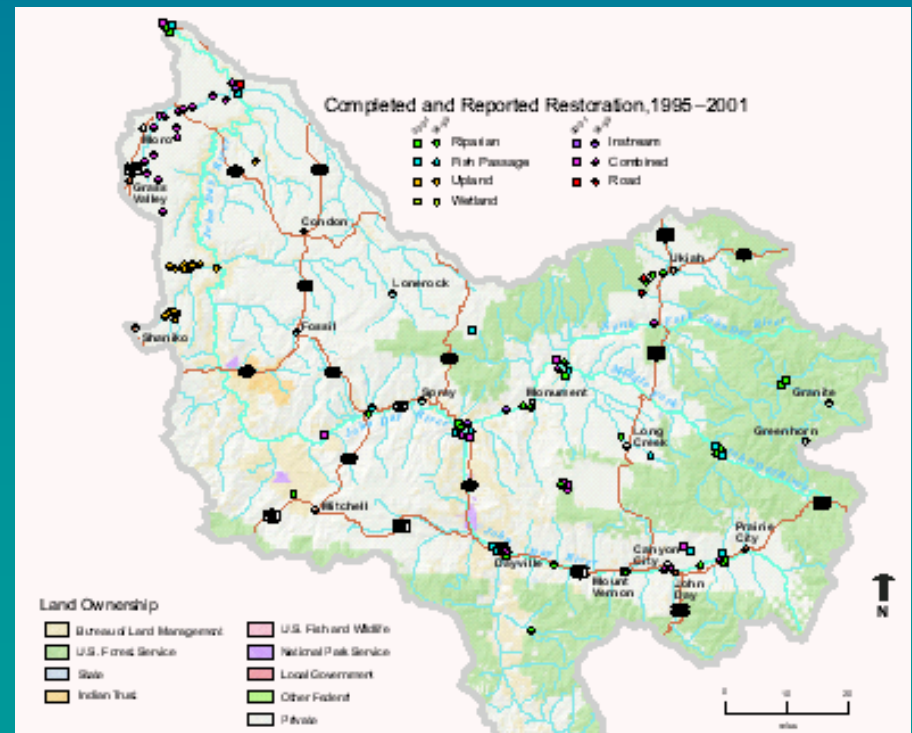
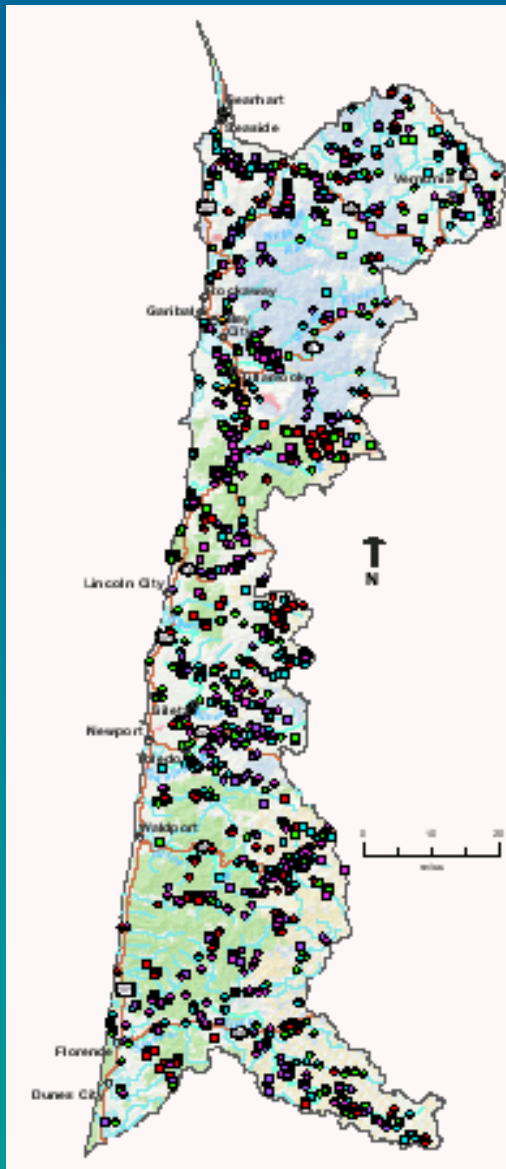


Low Gradient
Medium Flood Plain
(FP2)

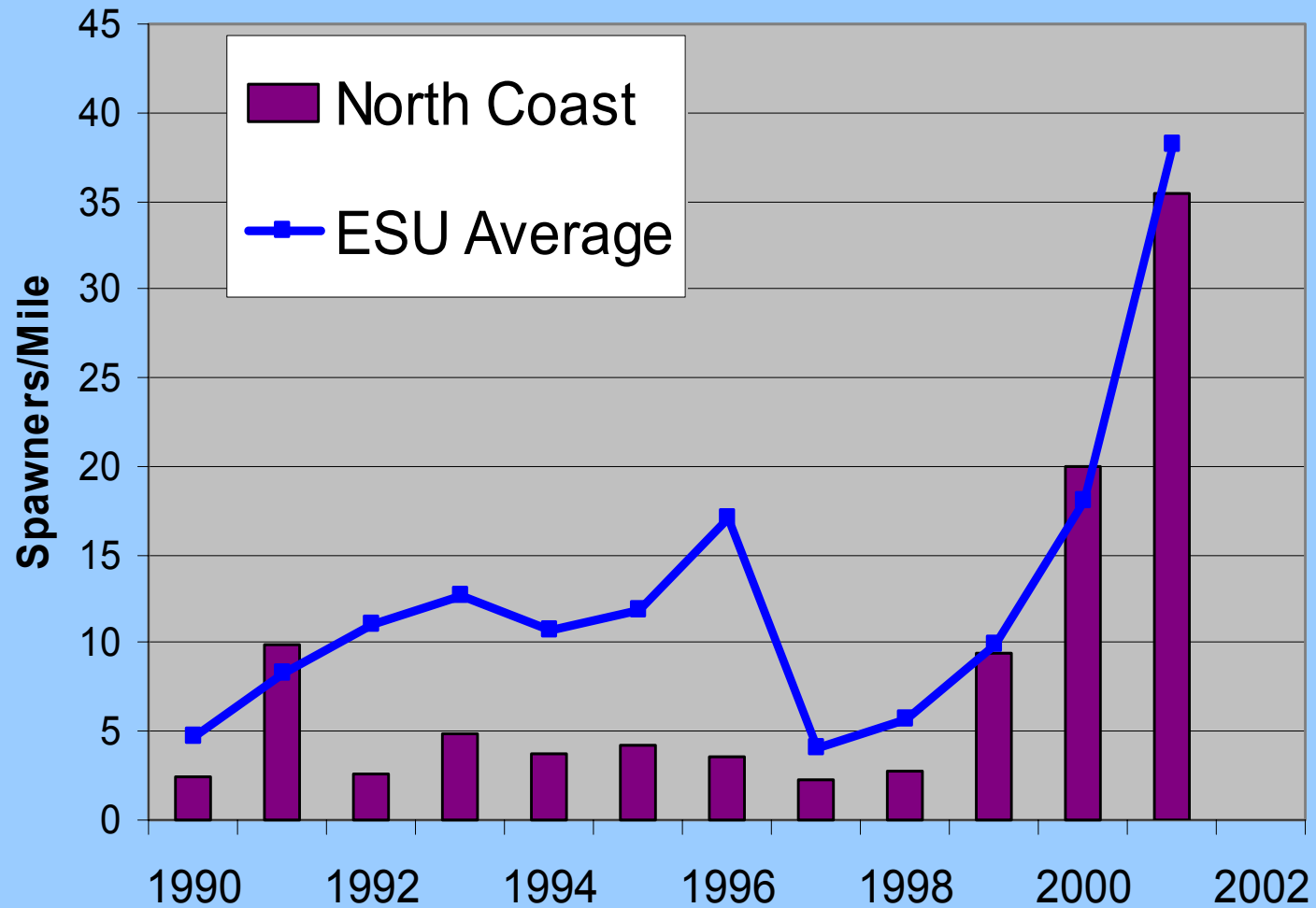


OWEB Reporting Basins and 4th Field Watersheds

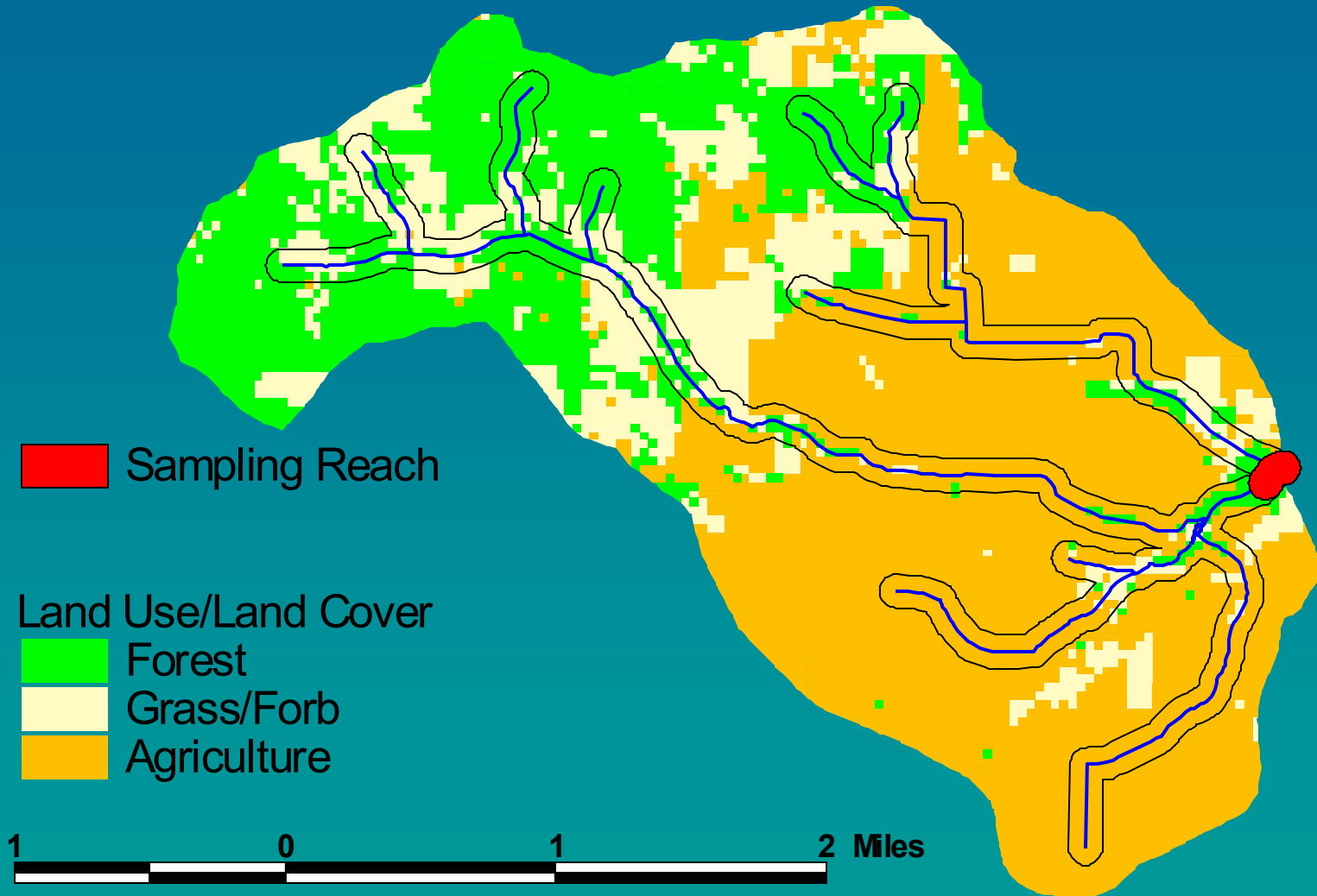
- Integrated-Quantitative-Analysis
- Telling the whole story



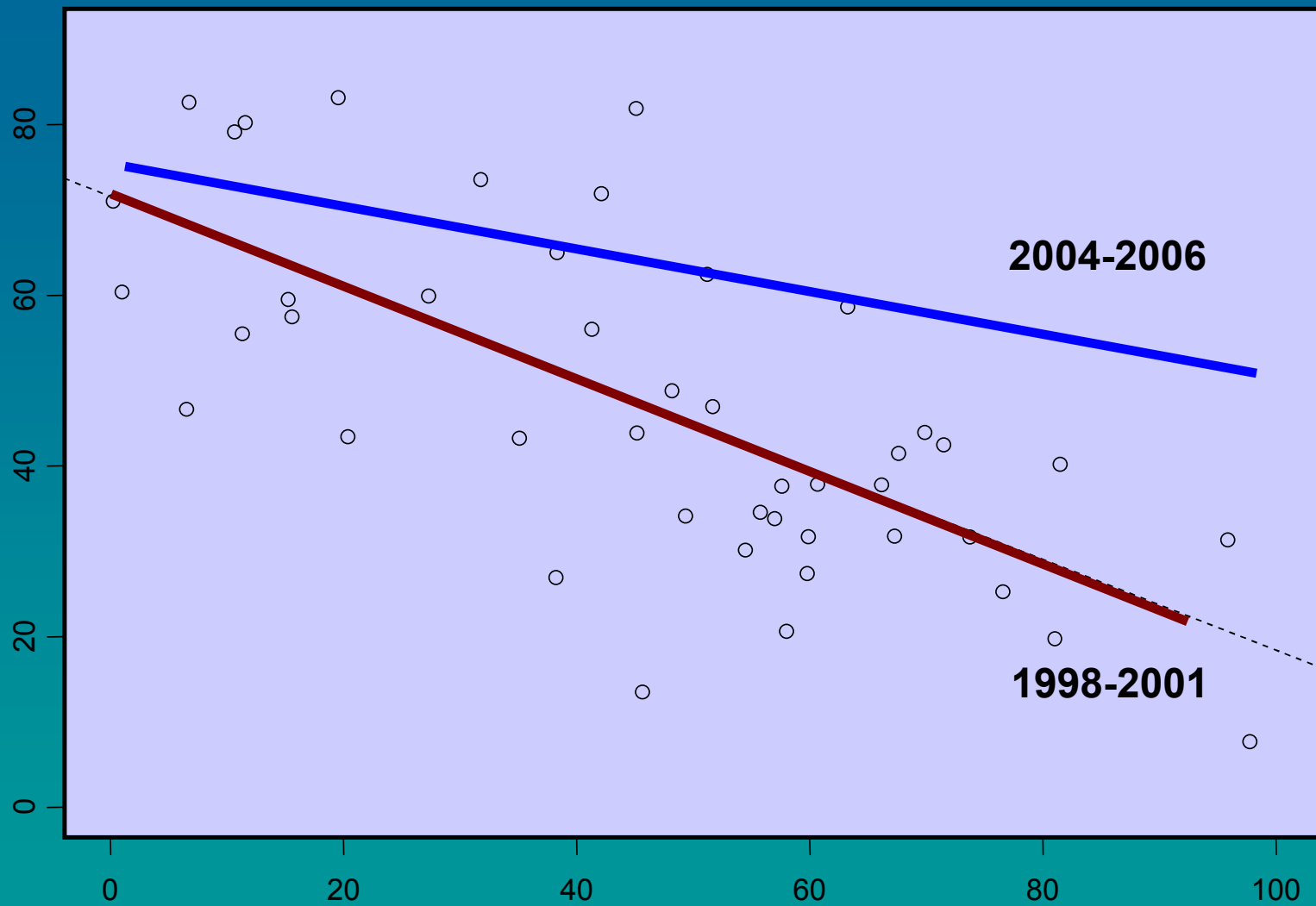
North Coast vs Coho ESU



Research and Monitoring in “Validation” Watersheds – Quantitative Effectiveness

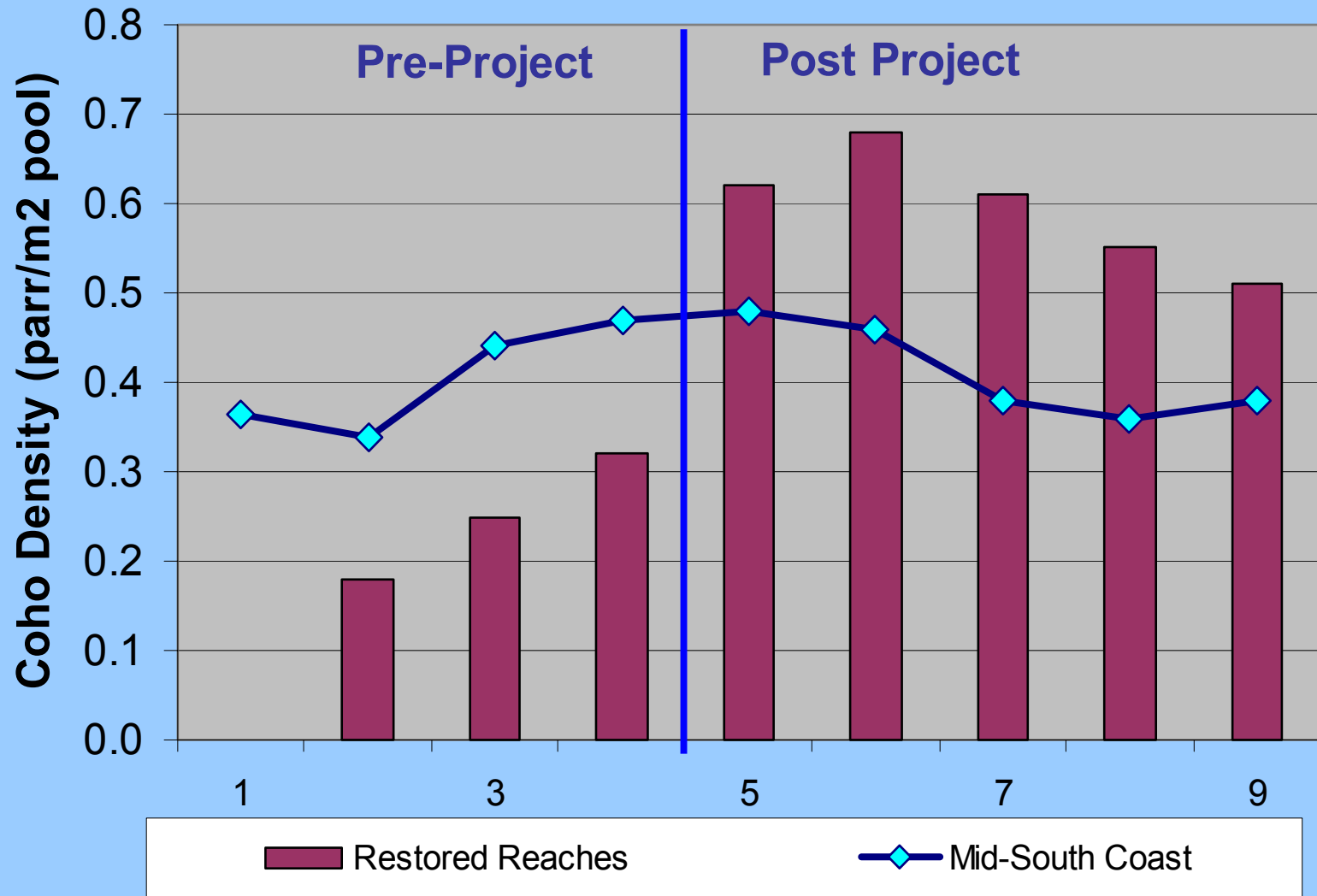


Fish Index of Biotic Integrity

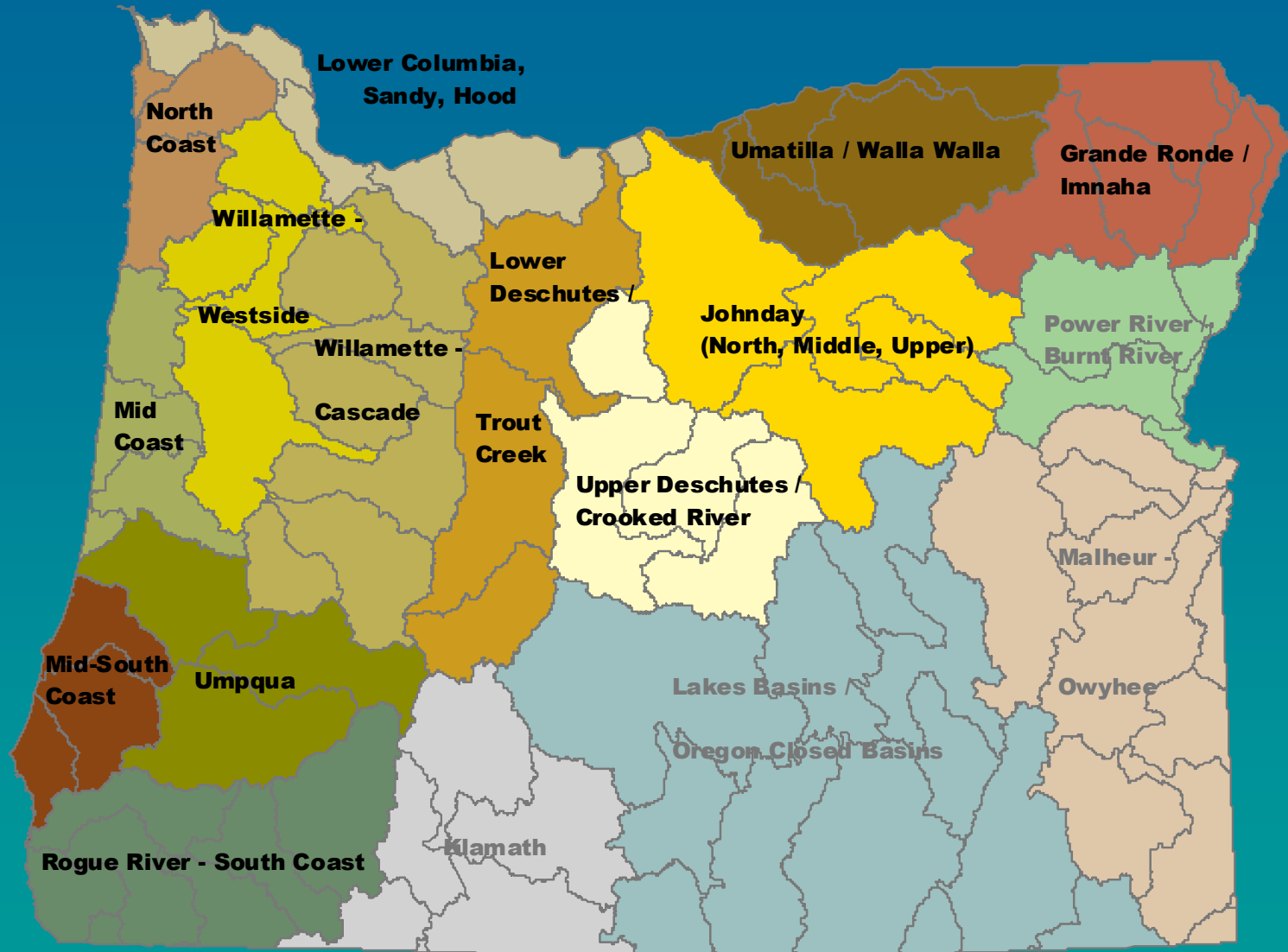


% Agriculture in Riparian Network

Restoration Project Monitoring in Context of Coho Monitoring Areas



Oregon Plan Monitoring Regions



Regional Coordination



More Information

- [**http://www.oweb.state.or.us/**](http://www.oweb.state.or.us/)
- [**http://www.orst.edu/Dept/ODFW/**](http://www.orst.edu/Dept/ODFW/)
- [**http://www.odf.state.or.us/DIVISIONS/
protection/forest_practices/**](http://www.odf.state.or.us/DIVISIONS/protection/forest_practices/)
- [**http://www.deq.state.or.us/**](http://www.deq.state.or.us/)